Small Cold Storages and Dairy Buildings

By J. A. RUDDICK

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DAIRY AND COLD STORAGE BRANCH

Commissioner ..... *J. A. Ruddick*
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SMALL COLD STORAGES

BY

J. A. RUDDICK AND JOS. BURGESS

INTRODUCTION

Large quantities of perishable food products are wasted every year in Canada for lack of simple cooling facilities, which may be provided at comparatively small cost. If farm homes, country stores, and hotels, butcher shops, etc., were more generally provided for the summer months with an adequate supply of ice, stored in a manner convenient for use, there would not only be a great saving of food supplies, but much food now consumed in a more or less deteriorated condition would be more palatable and more wholesome. The housewife, provided with such facilities, would also be able to buy in larger quantities and would have no difficulty in keeping a variety of perishable foods always on hand. A more general use of ice in the country would not only add much to the comfort of the people generally but would result in great saving of labour in many homes.

With regard to the ice which is stored, much of it is wasted, and the full benefit is not always derived from its use, owing to the faulty methods of storing, and lack of facilities for utilizing its cooling power to best advantage. Many of the so-called "coolers," "ice-boxes," "refrigerators," etc., in use at present, are wasteful of ice, inefficient in the matter of cooling, and frequently very insanitary. They have in many cases been constructed without regard to the most elementary principles of refrigeration, air circulation or sanitary conditions.

The plans, which are published herewith, have been thoroughly tried, and will, if carefully followed, give a dry storage at as low a temperature as it is praticable to obtain with the use of ice only.

It must be clearly understood, that these plans are not intended to provide "cold storage" as that term is generally understood. In a regular cold-storage warehouse various temperatures are maintained in the different rooms according to the class of goods stored therein. For butter, meat, fish, etc., a temperature as low as 10° F. to zero is required. With the use of ice alone a temperature below 38° to 40° F. cannot be obtained. Such temperatures are useful only for keeping the more highly perishable foods in a fresh condition for a short time, say from a few days to two or three weeks, depending on the natural keeping limit of the various products.

THE ORDINARY STORAGE OF ICE

The mere preservation of a few blocks of ice is a simple matter. Any unoccupied corner of an outbuilding or shed can be utilized. A rough framework of boards enclosing the necessary space and affording protection from the weather is all that is required. About 40 cubic feet should be allowed for every ton of ice to be stored. There should be no floor in this kind of an icehouse. If the soil is light and porous no special provision need be made for drainage. If it is impervious clay it will be better to provide some drainage. The earth should be covered to a depth of 6 to 12 inches with small stone, coarse gravel or cinders. About one foot of sawdust or planing-mill shavings should be placed under the ice. A space of at least one foot should be left between the ice and the walls, to be filled with sawdust or planing-mill shavings, the latter prefered. Cover the ice with one foot of the same material.

IMPROVED ICEHOUSES AND REFRIGERATORS

The plans shown and described in this bulletin are intended for those who may have to erect special icehouses or who may desire to provide more convenient and permanent facilities than the ordinary ice supply affords.

Plan No. 1 is intended primarily for the use of patrons of cheese factories, and is really a combined covered milk stand, milk cooling tank, and ordinary icehouse.

Plan No. 2 is an ordinary icehouse with dairy or milk room.

Plan No. 3 is an ordinary icehouse with refrigerator and milk room. The refrigerator in this plan is arranged on the same principle as an ordinary house refrigerator, only much larger and with a correspondingly large space for ice.

Plan No. 4 is a farm dairy, with insulated icehouse and refrigerator.

Plan No. 5 is an insulated icehouse and refrigerator, and is especially adapted for a large country house.

The design of plans 4 and 5 follows what is known as the automatic or circulation system. It provides for a permanent insulation of the walls, floor and ceiling of the ice-chamber which takes the place of the usual covering of sawdust or other packing material. In plans 1, 2, and 3 the insulation or covering of sawdust, shavings, or other material must be renewed every time the icehouse is filled.

In cases where convenience of operation and general efficiency are given first consideration, as against initial cost, we strongly recommend plan 4 for a dairy and cold storage combined, and plan 5 for a small cold storage suitable for country homes, institutions, hotels, etc. The first cost is greater, owing to the extra insulation, but the convenience and satisfaction which the circulation system gives, more than make up for the extra cost.

The advantages and disadvantages of the two systems are obvious. Plans 1, 2, and 3 provide for the cheapest construction, but the annual renewal of the insulation or covering material, and the labour of cleaning the ice, and filling the ice-boxes or refrigerators from time to time, are very important considerations. Plans 4 and 5 have the very decided advantage of being automatic in operation, thus requiring no attention throughout the season. The ice not being covered permits of a circulation of air between the ice-chamber and refrigerator for cooling purposes. The opening at the bottom of the partition between the ice-chamber and refrigerator allows the cold air to flow into the refrigerator while the warm air returns to the ice-chamber through a similar opening at the top of the partition.

These openings should not be over 6 by 18 inches, and both should be fitted with sliding covers to regulate the circulation of the air, or to shut it off entirely when not required. The circulation system also has the advantage of giving dry storage, because the moisture in the air which circulates is condensed on the cold surface of the ice.

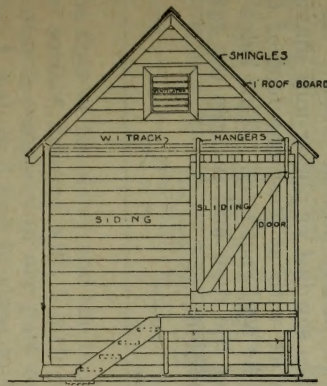
Section BB, plan 4, and section AA, plan 5 shows the refrigerator with a lower ceiling than the ice-chamber. The object of this is simply to reduce the air space which has to be cooled. The ceiling of the refrigerator need not be more than 7 feet high. Any space in excess of that height would be useless for storage purposes.

SPECIFICATION FOR PLAN No. 1

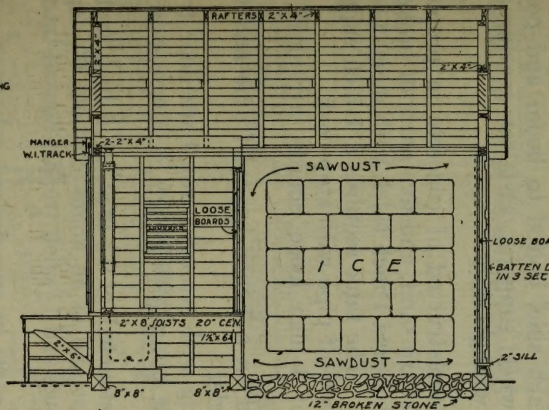
Icehouse with Milk Platform, Cooling Tank and Crane

Construction.—Level off the earth and bed 8-inch by 8-inch sills, halve them at the corners and bolt them together with two $\frac{3}{8}$-inch bolts to each joint.

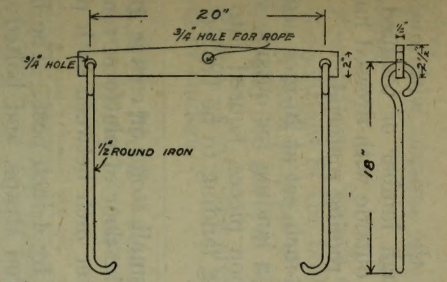
Set up 4-inch by 4-inch or 4-inch by 6-inch corner posts housed into sills, spiked and braced. Set up 2-inch by 4-inch filling in studs and lay 2-inch by



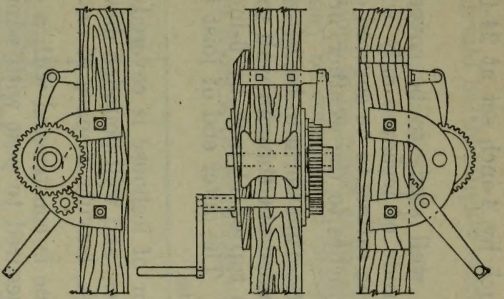
END ELEVATION



SECTION AA

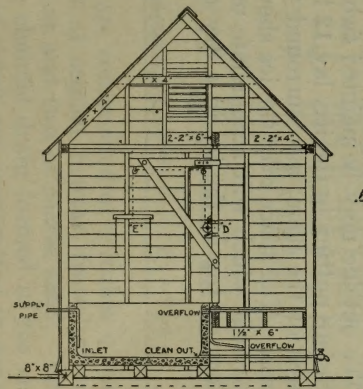


DETAIL OF YOKE AT "E"

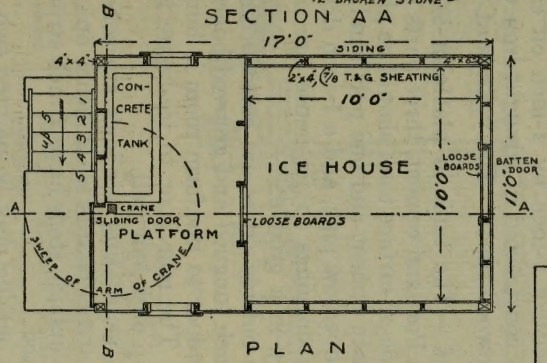


DETAIL OF WINCH AT "D"

SCALE 1 2 3 4 5 Inches



SECTION B.B.



PLAN

SCALE 1 2 3 4 5 6 7 8 9 10 feet

PLAN No 1

BULLETIN No 49

MILK PLATFORM WITH ICE HOUSE AND MILK COOLING TANK WITH CRANE

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W.C.C. 1917

4-inch double plate with joints staggered. Studs may be set at 24-inch or 30-inch centres.

Roof rafters 2-inch by 4-inch set at 24-inch centres and heeled over plate and spiked.

Sheathing.—The wall studs to be covered on the outside with matched siding and on the inside of icehouse only with rough lumber or tongued and grooved sheathing. The rafters to be covered on the outside with dressed lumber and shingles laid 4½ inches to the weather, or other roofing material.

Joists.—The joists of platform to be 2-inch by 8-inch, set at 20-inch centres. The joists to be extended out through wall to form a landing for outside steps. The joists to rest on top of 1½-inch by 6-inch ribbon pieces, housed into and nailed into studding. The outer end of joist forming landing to be braced with 2-inch by 6-inch struts.

Floors.—The floor of icehouse is covered with small stone or coarse gravel to a depth of 12 inches, and well pounded down. The floor of platform room is laid with 2-inch plank, leaving a space of one-quarter inch between each piece.

Crane.—The crane is constructed with a 4-inch by 4-inch post. The boom is 4-inch by 4-inch secured to post with wrought-iron straps, and bolted; also braced with a 1-inch by 4-inch on each side, bolted to boom and post. The winch is constructed of wrought-iron wheel supports, cast-iron gearing and dog, and hardwood spool. The yoke is of wrought-iron.

Tank.—The tank in platform is constructed of concrete in proportion of one part Portland cement, three parts sharp sand, and five parts of broken stone. The inside of surface tank should be plastered 1 inch thick with mortar composed of one part cement and one part sand. The tank requires a 1-inch supply pipe, 1¼-inch overflow pipe, and a 1-inch draw-off pipe with stop-cock.

The openings to ice-house are of 1-inch loose boards, arranged to slide vertically in a groove.

The outside doors are constructed on a 1-inch braced frame and sheathed with 1-inch tongued and grooved boards.

The door to platform room is hung with wrought-iron barn door track and trolley. The rear door to ice-house is hung with heavy T hinges and secured with hasp and door pull.

The ventilating windows are constructed of 1⅛-inch by 5-inch frame with ⅝-inch louvres boards set 3 inches apart and at an angle of about 60 degrees.

The outside steps have 2-inch strings and 1½-inch treads, housed into strings, and spiked.

The outside may be painted two coats in any desired colour.

Before putting in the ice, lay 12 inches sawdust or planer-mill shavings over the area of the floor; also surround the ice with at least one foot of the same material. The space over the ice should be well ventilated. This helps to carry off the heat which will accumulate under the roof, and to keep the sawdust or shavings on top of the ice in a dry condition.

SPECIFICATION FOR PLAN No. 2

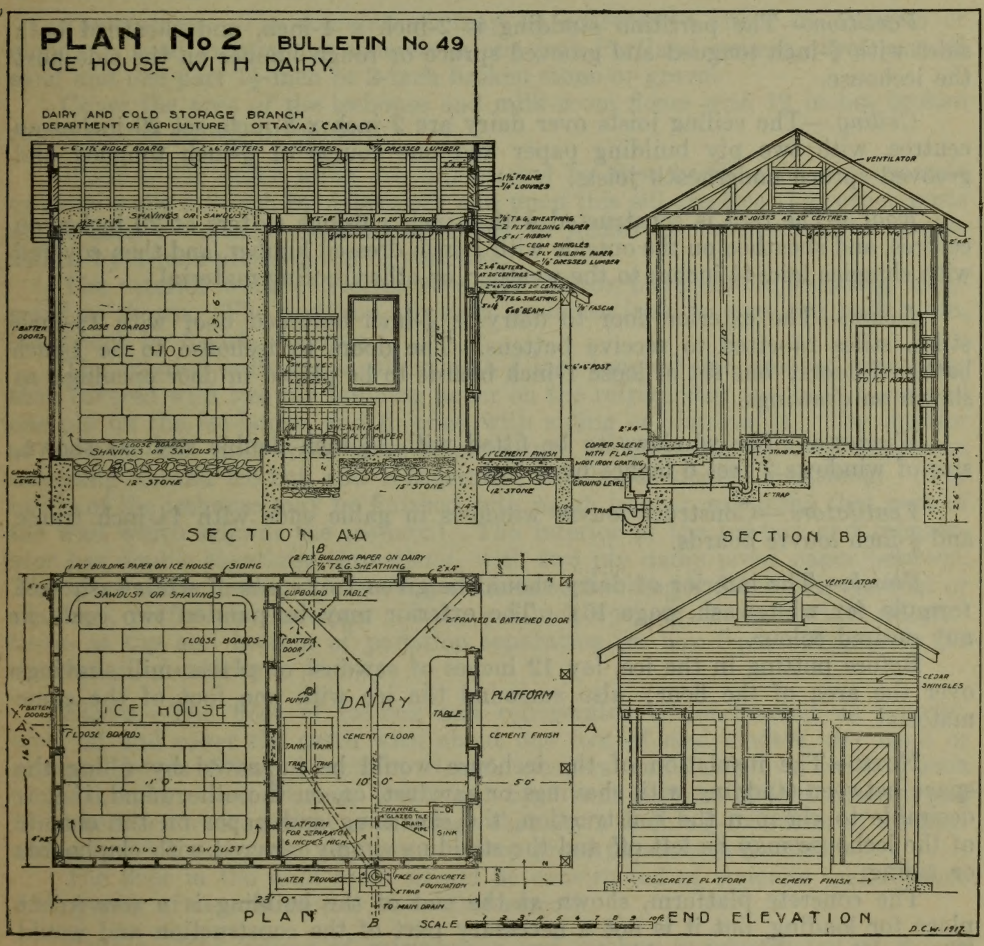
Icehouse with Dairy

All lumber used in the dairy should be thoroughly seasoned spruce, which is odourless.

If the soil under the icehouse is impervious clay, drainage should be provided.

Foundations.—Trench excavations to be made as indicated on the drawings. The foundations of the building may be constructed either of concrete or stone walls. A good mixture of concrete is one part of Portland cement, three parts of sand, and five parts of 1½-inch or 2-inch broken stone or clean gravel.

Floors.—Cover the area of the floors with 12 inches of broken stone, coarse gravel or cinders.



The floor of the dairy and the tanks are constructed of 4 inches of concrete and the surface finished with 1-inch coat of cement mortar, trowelled smooth. The mortar is composed of one part cement and two of coarse sand. The floor is graded 1 inch in 5 feet to slope to the channel drain formed in the concrete floor. The platforms for the separator and pump are constructed in connection with the floor, and built to any desired height.

Drains.—The drain piping inside the building, stand-pipes and traps in tanks, and trap at the outside of buildings are of 4-inch cast-iron. The grating to hand hole of outside trap may be either wrought or cast-iron.

Walls.—A 2-inch x 5-inch or 2-inch x 6-inch sill should be bedded on top of concrete or stone foundation walls. The exterior walls are constructed of 2-inch x 4-inch studding set about 20 inches on centres. The corner posts may be 4 x 4 inches, with 2-inch x 4-inch pieces spiked to two sides to receive the sheathing, or 4-inch x 6-inch with 2-inch x 4-inch spiked on one side. The corner post should be tenoned into sills, and well braced. The outside face of exterior walls should be sheathed with $\frac{7}{8}$-inch tongued and grooved spruce sheathing, then covered with two ply of building paper on the dairy and one ply on the icehouse, and finished with pine siding or clap-boards. The inside face of the dairy should be sheathed vertically with $\frac{7}{8}$-inch tongued and grooved spruce sheathing. The icehouse may be finished inside with spruce sheathing or rough lumber.

Partition.—The partition studding is 2-inch x 4-inch, and sheathed both sides with $\frac{7}{8}$-inch tongued and grooved spruce or rough lumber on the side next the icehouse.

Ceiling.—The ceiling joists over dairy are 2-inch x 8-inch, set 20 inches on centres, with two ply building paper and one course of $\frac{7}{8}$-inch tongued and grooved spruce underneath joists.

Roof.—The roof is constructed with 2-inch x 6-inch rafters at 20 inches on centres, and sheathed on the outside with $\frac{7}{8}$-inch dressed lumber, and then covered with shingles laid $4\frac{1}{2}$ inches to the weather, or other roofing material.

Doors.—The exterior door to dairy is $\frac{7}{8}$-inch battened door with $1\frac{3}{4}$-inch stiles, stiles rabetted to receive battens. The doors to icehouse to be 1-inch battened doors; one set of loose 1-inch boards to be placed in door openings, as shown on drawings.

Windows.—The windows to be fitted with $1\frac{1}{2}$-inch double sash as shown, size of windows 2 feet 6 inches by 5 feet.

Ventilators.—Construct louvre windows in gable ends with $1\frac{1}{2}$-inch frame and $\frac{3}{4}$-inch louvre boards.

Finish.—The interior of dairy should be given two coats of whitewash (see formula for whitewash, page 16). The exterior may be painted two coats in any desired colour.

Before putting in the ice, lay 12 inches of sawdust or planer-mill shavings over the area of the floor; also surround the ice with one foot of the same material.

NOTE.—The insulation of the icehouse would be improved by filling the space between studding with shavings or sawdust, or, on the other hand, if it is desirable to cheapen the construction, the sheathing and paper on the outside of the icehouse may be left off and the studding simply covered with clapboards or siding.

The concrete platform, shown at the end of the building is a convenient place for loading, but it is not a necessary part of the construction and would increase the cost considerably.

SPECIFICATION FOR PLAN No. 3

Icehouse with Refrigerator and Milk Room

All lumber used in the construction of the ice-box, refrigerator and milk room must be thoroughly seasoned, and free from all knots, shakes, or other defects. An odourless lumber like spruce is necessary to avoid the danger of tainting milk or butter.

Spruce or hemlock, in the order named, are the best woods for all inside work. Pine may be used for outside work where walls are insulated on the inside.

Drainage.—If the soil under the icehouse is impervious clay, drainage should be provided.

Foundations.—The foundations may be constructed either of concrete or stone. A good mixture for concrete is one part Portland cement, three part of sand and one part 1½-inch or 2-inch broken stone or gravel.

Cover the area of the icehouse and milk-room floors with 12 inches broken stone, coarse gravel, or cinders.

Walls.—The outer walls are constructed by first bedding on the concrete or stone walls a 2-inch by 5-inch sill and upon this sill erecting the corner posts and 2-inch by 4-inch studding at about 24 inches on centres, and a double 2-inch by 4-inch plate on top of studding.

The exterior walls of refrigerator and ice-box have double studding, staggered as shown. The partition, dividing ice-house from ice-box and milk room, has 2-inch by 6-inch studding.

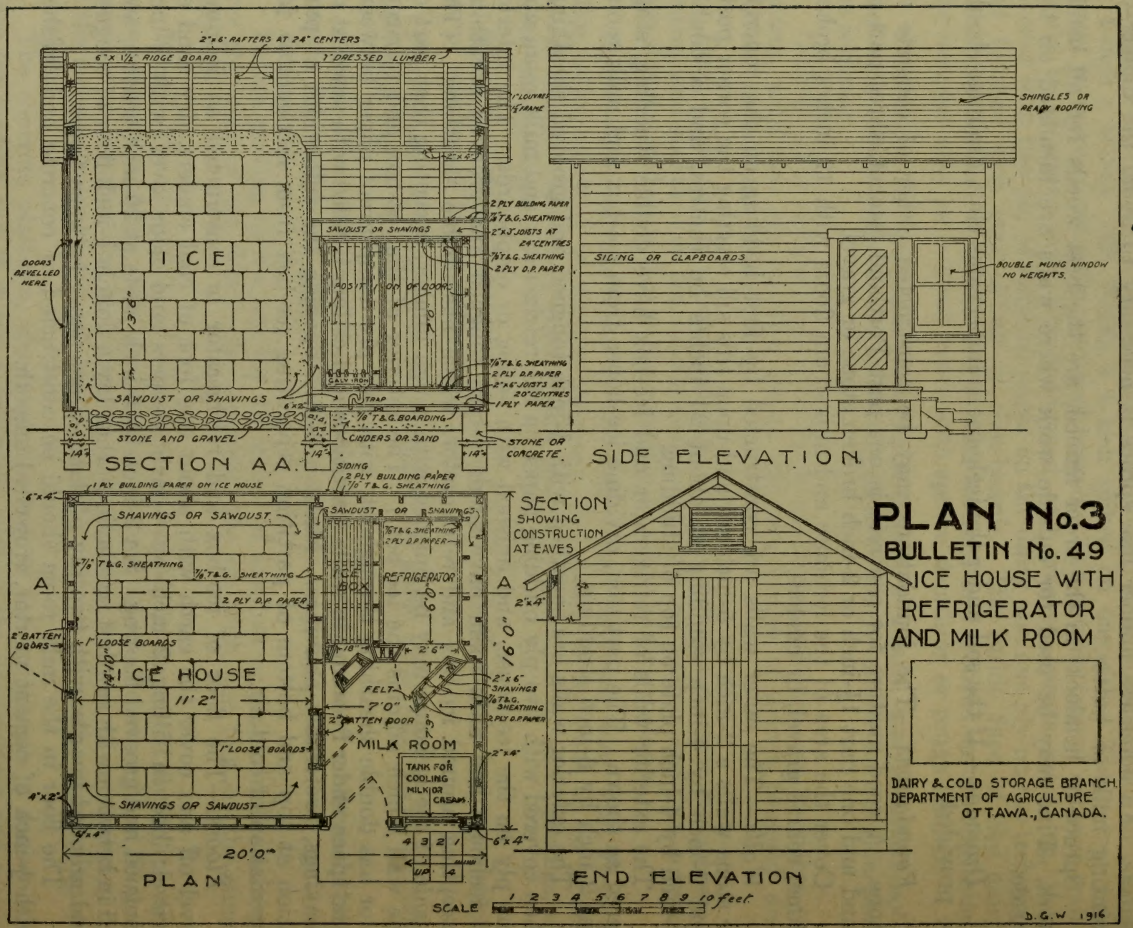
The exterior walls are sheathed with ⅞-inch tongued and grooved sheathing, then covered with two ply building paper on the refrigerator and milk room and one ply on the ice-house, and finished with siding or clapboards. The interior of icehouse and milk room have single ⅞-inch tongued and grooved sheathing excepting around ice-box and refrigerator, which has double sheathing. (The inside of the icehouse may be finished with rough lumber, excepting that part of the wall which adjoins the ice-box.) The interior of the ice-box and refrigerator has double sheathing throughout, with two ply damp-proof paper between. The space under floor and in walls, partitions and ceiling is filled with sawdust or shavings, preferably shavings. Make a 6-inch opening the full width of partition at top and bottom of partition separating ice-box from refrigerator for circulation of cold air.

Floors.—The floor of ice-box and refrigerator is constructed as follows: level off and cover the earth with about one foot of coal cinders, dry sand or gravel; bed in filling 2-inch by 4-inch sleepers and floor over with ⅞-inch tongued and grooved flooring. Set 2-inch by 6-inch joists at 20-inch centres, and fill in between with sawdust or shavings, then lay a double ⅞-inch floor of tongued and grooved boards, with two ply of damp-proof paper between floors.

The floor in the milk room should be constructed of concrete and finished with ½-inch of cement mortar, trowelled smooth.

Ceiling.—The ceiling of refrigerator and ice-box is constructed of 8-inch joists, filling, and double sheathing top and bottom, with two ply damp-proof paper between the sheathing and underneath, and two ply building paper above.

The ceiling of milk room is covered with two ply building paper and one course of sheathing underneath joists.


2"x6" RAFTERS AT 24" CENTERS
6"X 1½" RIDGE BOARD
1" DRESSED LUMBER
1" LOUVRE
GLASS
SHINGLES OR READY ROOFING
2 PLY BUILDING PAPER
⅞" T.&G. SHEATHING
2"x8" JOISTS AT 24" CENTRES
⅞" T.&G. SHEATHING
2 PLY D.P. PAPER
SAWDUST OR SHAVINGS
ADMISSION OF DOOR
DOORS REVELLED HERE
ICE
SIDING OR CLAPBOARDS
DOUBLE HUNG WINDOW NO WEIGHTS.
⅞" T.&G. SHEATHING
2 PLY D.P. PAPER
2"x6" JOISTS AT 20" CENTRES
1 PLY PAPER
SAWDUST OR SHAVINGS
TRAP
⅞" T.&G. BOARDING
STONE AND GRAVEL
CINDERS OR SAND
STONE OR CONCRETE
SECTION A.A.
SIDE ELEVATION
SIDING
2 PLY BUILDING PAPER
⅞" T.&G. SHEATHING
1 PLY BUILDING PAPER ON ICE HOUSE
SHAVINGS OR SAWDUST
⅞" T.&G. SHEATHING
2 PLY D.P. PAPER
2" BATTEN DOORS
1" LOOSE BOARDS
ICE HOUSE
11' 2"
1" LOOSE BOARDS
SHAVINGS OR SAWDUST
20'0"
PLAN
SAWDUST OR SHAVINGS
⅞" T.&G. SHEATHING
2 PLY D.P. PAPER
ICE BOX
REFRIGERATOR
6'0"
2'6"
FELT
2"x6" SHAVINGS
⅞" T.&G. SHEATHING
2 PLY D.P. PAPER
2" BATTEN DOOR
MILK ROOM
TANK FOR COOLING MILK OR CREAM
2"x6"
6"x4"
SECTION SHOWING CONSTRUCTION AT EAVES
16'0"
2"x4"
END ELEVATION
SCALE
1 2 3 4 5 6 7 8 9 10 feet
PLAN No.3
BULLETIN No. 49
ICE HOUSE WITH REFRIGERATOR AND MILK ROOM
DAIRY & COLD STORAGE BRANCH.
DEPARTMENT OF AGRICULTURE
OTTAWA., CANADA.
D.G.W 1916

About 6 inches above the floor in ice-box, place 2-inch by 4-inch bars at 4-inch centres, as shown. The floor of ice-box is covered with galvanized iron extending up on walls, forming a pan, this pan to be connected with a 2-inch trapped drip pipe, as shown.

Roof.—The roof is constructed of 2-inch by 4-inch rafters set at 24-inch centres, sheathed on top with $\frac{7}{8}$-inch dressed lumber and then covered with shingles laid $4\frac{1}{2}$ inches to the weather, or other roofing material.

Doors.—The exterior doors have 2-inch stiles and $\frac{7}{8}$-inch battened panels. The doors to ice-box and refrigerator to be fitted with bevelled frames, the edges of doors to be bevelled to fit the frames, and doors double sheathed both sides with $\frac{7}{8}$-inch tongued and grooved spruce, and two ply paper between. The 6-inch space in doors is to be filled with shavings, and the bevel faces to be covered with felt or canvas to make as nearly as possible an air-tight joint.

Windows.—The windows to be fitted with $1\frac{1}{2}$-inch double sash, as shown.

Ventilators.—Construct louvre windows in gable ends with $1\frac{1}{2}$-inch frame and $\frac{3}{4}$-inch louvre boards.

Finish.—The interior of the refrigerator and milk-room should be given two coats of whitewash. (See formula for whitewash on page 16). The ice-box should have two coats of shellac or boiled linseed oil. The exterior may be painted two coats in any desired colour.

Before putting in the ice, lay 12 inches of sawdust or planer-mill shavings over the area of the ice-house floor, also surround the ice with 1 foot of the same material.

NOTE.—The insulation of the ice-house would be improved by filling the space between the studding with shavings or sawdust or, on the other hand, if it is desirable to cheapen the construction the sheathing and paper on the outside of the ice-house may be left off and the studding simply covered with siding or clapboards.

SPECIFICATION FOR PLAN No. 4

Farm Dairy with Insulated Icehouse and Refrigerator

All lumber must be thoroughly seasoned and dry and free from all knots, shakes or other defects, and must be odourless.

Spruce or hemlock in the order named are the best woods for all inside work. Pine may be used for outside work where the walls are insulated on the inside.

Foundations.—Trench excavations to be made as indicated on the drawings. The foundations may be constructed either of concrete or stone.

A good mixture of concrete is one part Portland cement, three parts of sand, and five parts of $1\frac{1}{2}$-inch or 2-inch broken stone or clean gravel.

The area of the ice-chamber should be excavated to the desired depth. Grade the earth with a slope of 2 inches to one end, and lay one row of 3-inch field tile along the lower end and extending through the foundation to a drain. Four rows of the same sized tile should be laid across the floor and connected with the row draining to the outside. A trap should be provided just outside of the foundation to prevent warm air entering. Cover the floor area with 12 inches broken stone, coarse gravel or cinders, and on top of the filling place 12 inches of shavings or sawdust, covering same with 1-inch rough lumber.

Floors.—The floor of dairy and tanks are constructed of 4 inches of concrete and the surface finished with 1-inch coat of cement mortar trowelled

smooth. The mortar is composed of one part cement and two of coarse sand. The floor is graded 1 inch in 5 feet to slope to the channel drain formed in the concrete floor. The platforms for the separator and pump are constructed in connection with the floor and built to any desired height.

The floor of refrigerator and ante-room has a concrete slab with 3 inches of cork board laid on top, and finished with a 1-inch coat of cement mortar.

All concrete floors should be laid on top of broken stone or large gravel ballast, as indicated on drawings.

The drain pipe inside the building, stand pipes and traps in tanks, and trap at outside of building are of 4-inch cast-iron pipes. The grating to hand-hole of trap outside the building may be either wrought or cast-iron.

Walls.—The walls of dairy are constructed of 2-inch by 4-inch studding set about 16-inch centres, with 4-inch x 6-inch corner posts. The walls are sheathed inside and outside with $\frac{7}{8}$-inch tongued and grooved sheathing, and then covered on the outside with two ply building paper and finished with siding or clapboards. The walls of refrigerator, ice-chamber, and ante-room are constructed of 2-inch by 4-inch studding, staggered as shown on plan, and sheathed with double $\frac{7}{8}$-inch tongued and grooved spruce sheathing inside, with two ply of damp-proof paper between sheathing. The outside is constructed of single sheathing, two ply of building paper, and finished with clapboards or siding. The inside face of ice-chamber walls has two ply of damp-proof paper and then furred with 1-inch by 2-inch furring strips and sheathed with another course of $\frac{7}{8}$-inch sheathing.

Partitions.—The partition between ice chamber, refrigerator, and ante-room is constructed the same as the walls, with double sheathing each side and two ply damp-proof paper between. The ice-chamber side has, in addition, two ply damp-proof paper, 1-inch by 2-inch furring strips, and sheathing.

The partition between the refrigerator and ante-room is constructed of 2-inch by 6-inch studding, with double sheathing, on both sides and two ply damp-proof paper between sheathing.

Make 6-inch by 12-inch openings at the ceiling and the floor of partition between refrigerator and ice-chamber for air circulation; these openings to have sliding door dampers.

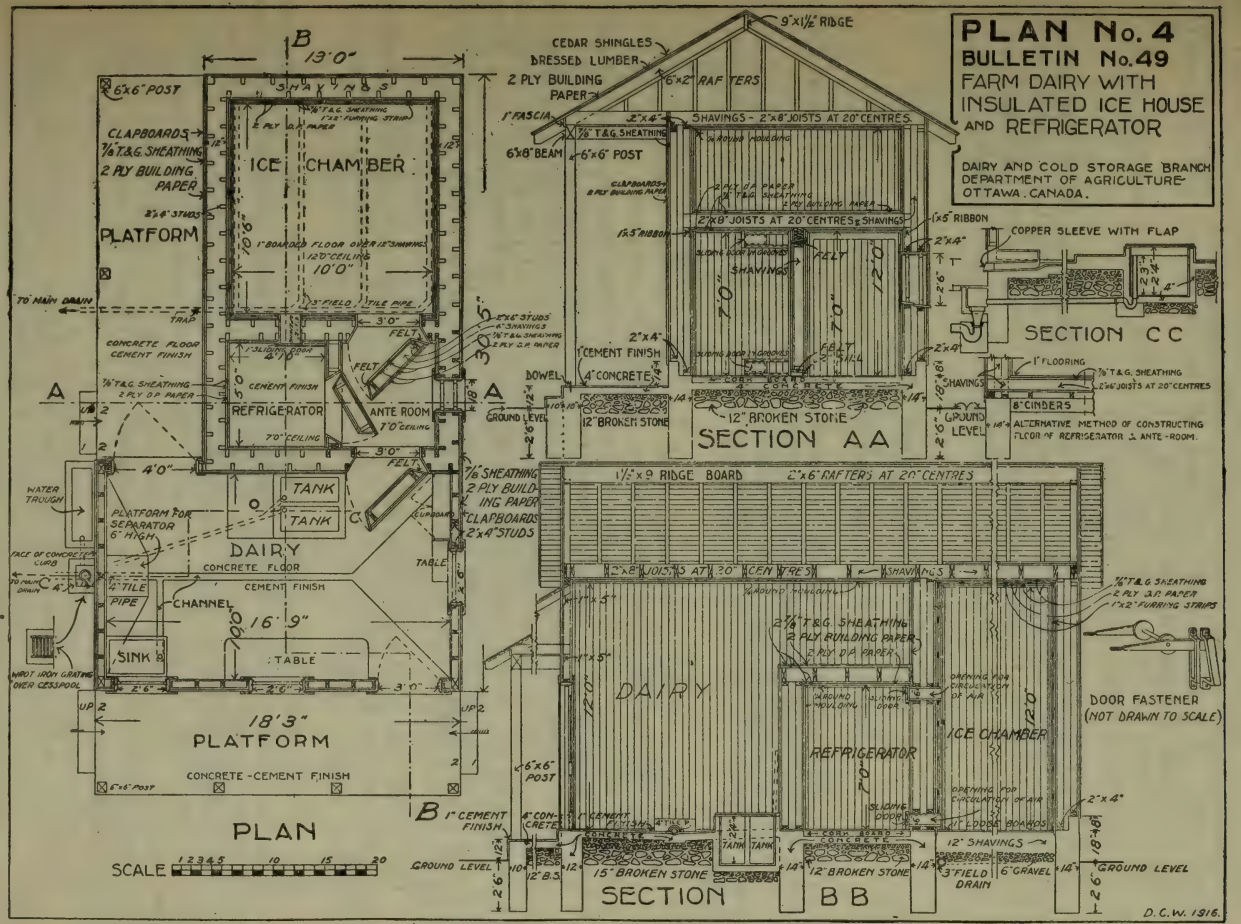
Ceilings.—The ceilings are constructed of 2-inch by 8-inch joists set at 20-inch centres, with double $\frac{7}{8}$-inch tongued and grooved sheathing on top and bottom, with two ply damp-proof paper between sheathing underneath, and two ply building paper above. The ice-chamber ceiling has, in addition, two ply of damp-proof paper, 1-inch by 2-inch furring strips, and sheathing similar to walls. The ceiling of the dairy has two ply building paper and one course of sheathing or underside of joists. The ceilings of refrigerator and ante-room are 7 feet high to underside of sheathing; ceiling of ice-chamber and dairy are 12 feet high.

The walls, ceilings, and partitions of ice-chamber, refrigerator, and ante-room are filled with sawdust or shavings, preferably shavings.

Roof.—The roof is constructed of 2-inch by 6-inch rafters set at 20-inch centres and covered on the outside with $\frac{7}{8}$-inch dressed lumber, two ply building paper, and shingles laid $4\frac{1}{2}$ inches to the weather, or other roofing material.

Platform.—The platform has 6-inch by 6-inch posts, 6-inch by 8-inch beam, 2-inch by 6-inch ceiling joists sheathed on the under side, and 2-inch by 4-inch rafters sheathed and shingled. (The platforms are convenient for loading and passing from the dairy to the stable, but are not a necessary part of the construction, and will add materially to the cost).

Doors.—The exterior doors to dairy are $\frac{7}{8}$-inch battened doors with $1\frac{3}{4}$-inch ledged and braced frame. The doors to ante-room, refrigerator, and ice-chamber


PLAN No. 4
BULLETIN No. 49
FARM DAIRY WITH INSULATED ICE HOUSE AND REFRIGERATOR
DAIRY AND COLD STORAGE BRANCH DEPARTMENT OF AGRICULTURE OTTAWA. CANADA.
PLAN
SECTION AA
SECTION BB
SECTION CC
ICE CHAMBER
PLATFORM
DAIRY
REFRIGERATOR
ANTE ROOM
TANK
TANK
SINK
TABLE
CHANNEL
CONCRETE FLOOR
CEMENT FINISH
18'3" PLATFORM
CONCRETE-CEMENT FINISH
SCALE 1 2 3 4 5 10 15 20
CEDAR SHINGLES
DRESSED LUMBER
2 PLY BUILDING PAPER
9"x1½" RIDGE
6"x2" RAFTERS
SHAVINGS - 2"x8" JOISTS AT 20" CENTRES
6"x6" POST
6"x8" BEAM
CLAPBOARDS
2 PLY BUILDING PAPER
2"x8" JOISTS AT 20" CENTRES & SHAVINGS
1"x5" RIBBON
COPPER SLEEVE WITH FLAP
SLIDING DOOR IN GROOVES
FELT
SHAVINGS
2"x4"
CEMENT FINISH
4" CONCRETE
DOWEL
12" BROKEN STONE
GROUND LEVEL
1" FLOORING
⅞" T.&G. SHEATHING
2"x6" JOISTS AT 20" CENTRES
8" CINDERS
ALTERNATIVE METHOD OF CONSTRUCTING FLOOR OF REFRIGERATOR & ANTE-ROOM.
1½"x9" RIDGE BOARD
2"x6" RAFTERS AT 20" CENTRES
2"x8" JOISTS AT 20" CENTRES
⅞" T.&G. SHEATHING
2 PLY BUILDING PAPER
1"x2" FURRING STRIPS
CLAPBOARDS
2"x4" STUDS
DOOR FASTENER
(NOT DRAWN TO SCALE)
15" BROKEN STONE
3" FIELD DRAIN
6" GRAVEL
12" SHAVINGS
D.C.W. 1916.

are to be fitted with bevelled frames, the edges of doors to be bevelled to fit frames, and double sheathed both sides with $\frac{7}{8}$-inch tongued and grooved sheathing, with two ply damp-proof paper between. The doors to have a 6-inch space as shown on plan, filled with shavings. The bevelled face of doors to be covered with felt or canvas to make as nearly as possible an air-tight joint.

Windows.—The small window in the ante-room has a $1\frac{1}{2}$-inch inside and outside sash. A wooden shutter hinged at the top or an awning should be provided to keep out the rays of the sun.

The windows in dairy to be fitted with $1\frac{1}{2}$-inch double hung sash as shown, size of windows 2 feet 6 inches by 5 feet.

Finish.—The interior of the ice chamber should be given two coats of boiled linseed oil or shellac. The interior of the refrigerator, ante-room and dairy should have two coats of whitewash. (See formula for whitewash on page 16.) The exterior may be painted two coats in any desired colour.

SPECIFICATION FOR PLAN No. 5

Insulated Icehouse and Small Refrigerator

All lumber must be thoroughly seasoned and dry and free from knots, shakes, and other defects, and must be odourless.

Spruce or hemlock, in the order named, are the best woods for all inside work. Pine may be used for outside work where the walls are insulated on the inside.

Foundations.—Trench excavations to be made as shown on the drawings. The foundations may be constructed either of concrete or stone.

A good mixture of concrete is one part of Portland cement, three parts of sand and five parts of $1\frac{1}{2}$-inch or 2-inch broken stone or clean gravel.

The area of the ice-chamber floor should be excavated to the desired depth. Grade the earth with a slope of 2 inches to one end, and lay one row of 3-inch field tile along the lower end and extending through the foundation to a drain. Four rows of the same sized tile should be laid across the ground and connected with the row draining outside. A trap should be provided just outside of the foundation.

Cover the floor area with 12 inches of broken stone, coarse gravel, or cinders, and on top of this filling place 12 inches of shavings or sawdust, covering same with 1-inch rough boards.

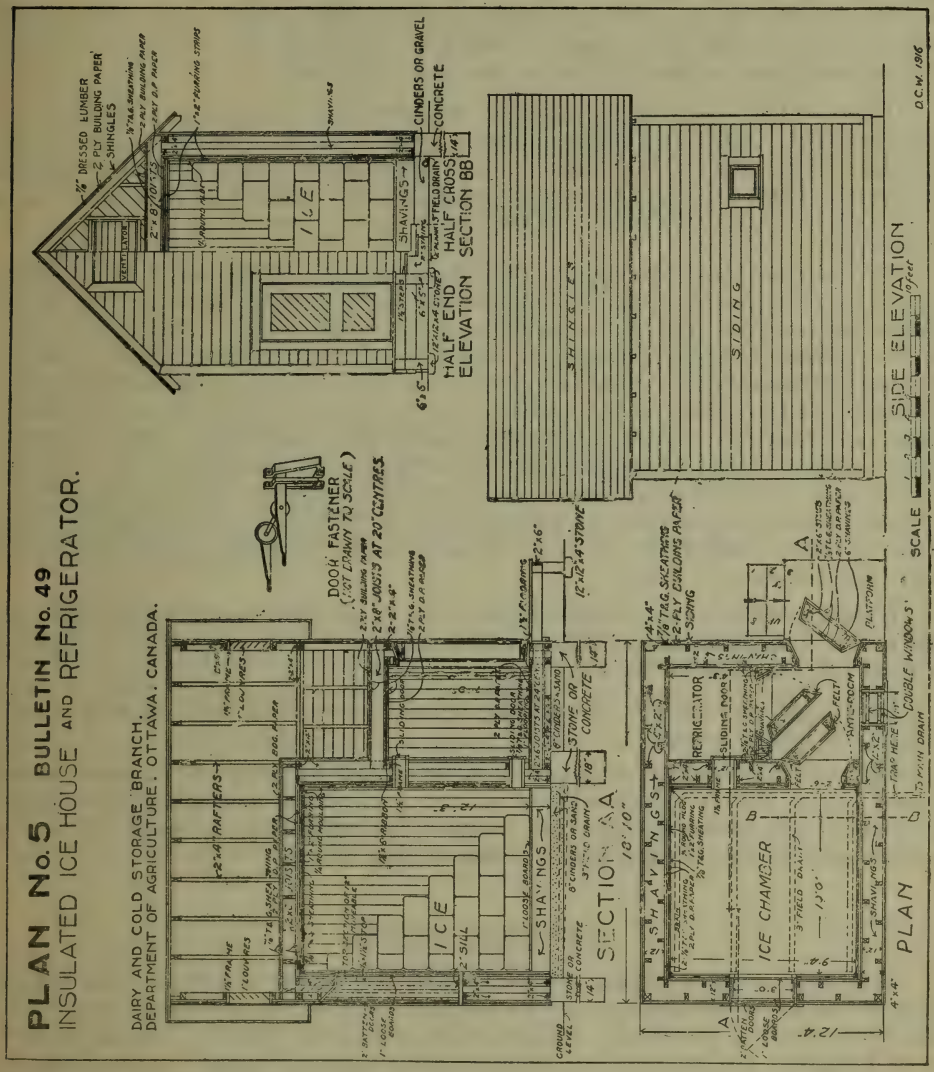
Walls.—The walls are constructed of 2-inch by 4-inch studding, staggered as shown on plan. The walls are double sheathed inside with $\frac{7}{8}$-inch tongued and grooved spruce, with two ply of damp-proof paper between. The outside face has a single course of $\frac{7}{8}$-inch sheathing with two ply of building paper, and then covered with siding or clapboards. The ice-chamber, in addition to the above, has the inside sheathing covered with two ply of damp-proof paper and then furred with 1-inch by 2-inch furring strips and sheathed with $\frac{7}{8}$-inch tongued and grooved sheathing.

Partitions.—The partition between the ice-chamber, refrigerator, and ante-room is constructed the same as the walls, with double sheathing each side and two ply damp-proof paper between. The ice-chamber side has, in addition, two ply damp-proof paper, 1-inch by 2-inch furring strips, and sheathing.

The partition between the ante-room and refrigerator is constructed of 2-inch by 6-inch studding with double sheathing on both sides, and two ply damp-proof paper between sheathing.

Make 6-inch by 12-inch openings at ceiling and floor in partition between ice-chamber and refrigerator for circulation of cold air; these openings to have sliding dampers.

Ceilings.—The height of ceiling in ante-room and refrigerator is 7 feet from floor in the clear, and that in ice-chamber is 12 feet. The ceilings are constructed



of 2-inch by 8-inch joists set at 20 inches on centres and double sheathed top and bottom with two ply damp-proof paper between sheathing underneath and two ply building paper above. The ceiling of ice-chamber has, in addition, two ply of damp-proof paper 1-inch by 2-inch furring strips and another course of $\frac{7}{8}$-inch sheathing similar to walls.

The walls, ceilings, and partitions are completely filled with sawdust or shavings, preferably shavings.

Roof.—The roof is constructed of 2-inch by 4-inch rafters set at 24-inch centres and covered with $\frac{7}{8}$-inch dressed lumber, two ply building paper, and shingles laid $4\frac{1}{2}$ inches to the weather, or other roofing material.

Floors.—The floor of ante-room and refrigerator is constructed by first laying a course of coal cinders or sand 8 inches thick and bedding 2-inch by 4-inch sleepers on top, then set 2-inch by 6-inch joists at 24-inch centres across sleepers, and finish by laying one course of $\frac{7}{8}$-inch sheathing diagonally; cover with two ply of damp-proof paper and 1-inch tongued and grooved spruce flooring.

In plan No. 4, concrete and cork board are used in the construction of the refrigerator and ante-room floors. This construction is much the best, and as it is of permanent nature will be the cheapest in the end.

Doors.—The doors to ice-chamber, refrigerator, and ante-room to be fitted with bevelled jambs, and edges of doors bevelled to fit; the doors are double sheathed inside and outside with two ply damp-proof paper betwen sheathing, the doors to have a 6-inch space, as shown, filled with shavings, the bevelled faces of doors to be covered with felt or canvas to make as nearly as possible an air-tight joint.

The exterior door opening into the ice-chamber is a batten door 6 feet by 3 feet, which is provided for stowing ice during the winter season. The frame is bevelled and the edges of the door bevelled to fit the frame. The door is made of two courses of $\frac{7}{8}$-inch sheathing, with two ply of building paper between. Two sets of loose boards must be provided as shown on plan, one set to fit into the frame on the inside and the other set to fit as close to the door as possible. These boards are to be placed in position when the ice-chamber is filled and the space between (about 10 inches) filled with planer-mill shavings or dry sawdust.

In cases where it is convenient to store the ice through the ante-room, this door may be dispensed with, as a direct opening outside is liable to cause waste of ice unless the filling of shavings or sawdust is carefully packed into place each time the door is used.

Window.—The small window in the ante-room has $1\frac{1}{2}$-inch inside and outside sash. A wooden shutter hinged at the top, or an awning, should be provided to keep out the rays of the sun.

Ventilator.—Construct louvre windows in gable ends with $1\frac{1}{2}$-inch frame and $\frac{3}{4}$-inch louvre boards.

Finish.—The interior of the ice-chamber should be given two coats of boiled linseed oil or shellac. The interior of the refrigerator and ante-room should have two coats of whitewash (see formula for whitewash on page 16). The exterior may be painted two coats in any desired colour.

GENERAL NOTES

Insulation.—Refrigerating engineers have during the last few years practically discarded the empty space—the so-called dead-air space—once extensively used for insulating purposes. Theoretically, a dead-air space is a poor conductor of heat, but the ordinary air space is not a dead-air space. As one side of the space becomes warmer than the other, the air immediately in contact with it becomes lighter on acount of the increase in temperature, and at once ascends, while colder air from the other side takes it place. Thus we have a circulation of air within the space, and heat is carried from one side to the other by convection.

Moreover, it is extremely difficult to get the work done properly when empty spaces are depended on for insulation. The slightest crack or opening, even a nail hole, tends to destroy the efficiency of this form of construction.

In the insulation of wooden walls, the best practice at the present time provides for an outer and inner shell, as nearly as practicable impervious to air and dampness, with a space between to be filled with some non-conducting

material. The width of the space will depend on the filling to be used and the temperature to be maintained in the storage room.

For a cold storage constructed of wood, there is no better material for filling spaces than planer-mill shavings. Where available at all, they are cheap; they are elastic and do not settle readily, but, most important of all, they can be obtained in a very dry condition, which is essential; and further, they do not absorb moisture readily after being placed in position. There may be some difficulty in obtaining a sufficient supply of shavings in places remote from manufacturing centres, but many of the large sash and door factories now pack shavings in bales, weighing about 75 pounds each, for convenience in shipping. The weight of shavings required to fill a given space will depend somewhat on the kind of wood from which they are made, and also to some extent on how tightly they are packed, but a fair average is from 7 to 9 pounds per cubic foot of space. They should be packed sufficiently to prevent subsequent settling.

Sawdust versus Shavings.—Because it costs little or nothing and is readily available in most country districts, there has been a tendency to use sawdust for filling spaces in walls in small cold-storage buildings. We would point out, however, that it is not as satisfactory a material for this purpose as shavings, owing to the fact that while shavings are cut from dry lumber, sawdust is cut from green timber and is generally more or less lamp. The dampness destroys its insulating value and encourages the growth of mould and rot, resulting in a musty odour in the storage room which would be injurious to the food stored therein. The growth of mould and heating would also cause settling of the sawdust and would leave open spaces which weakens the insulation. It is very important, therefore, that sawdust which is used for filling walls must be as dry as possible or the storage will be very unsatisfactory, and will soon become unfit for storing perishable foods.

Insulation must be dry.—One of the problems in cold storage construction is to provide against moisture being absorbed by the materials composing the insulation. In the construction of small ice cold storages, moisture or dampness is more likely to come from the inside, and provision must be made to protect the insulation. It must be understood that dampness, as referred to in this connection, does not imply the presence of water in the ordinary sense, but simply the presence of moisture as we find it, say, in green lumber as compared with dry or well seasoned lumber.

In a wooden wall filled with shavings, it is the shavings which must be protected from dampness. This can be done by using damp-proof paper between the sheathing, or boarding, on the inside of the walls.

Brick, stone or concrete walls.—If it is desired to erect a building of brick, stone, or concrete, such walls will only take the place of the outside finish of the wooden walls of the plans shown in this bulletin, and the same insulation must be used inside the brick, stone, or concrete. None of these materials have much insulating value, and as erected in an ordinary wall are just about equal, for that purpose, to two courses of lumber.

Brick or cement absorb moisture readily, and unless they are given some special waterproofing treatment, the insulating quality of such a wall is rather low. The outside surfaces of brick walls may be painted with some effect, but where shavings are to be used inside of brick or concrete, the inner surface may be coated with pitch, paraffin wax, or some of the patented coatings on the market. Coating walls with either pitch or paraffin in cold or even cool weather without special apparatus is a rather difficult operation, on account of the tendency of both substances to harden very quickly. In using pitch, care must be taken not to get tar, or any mixture of tar, which would be ruinous on account if its odour. Pitch is odourless when it hardens. If the inside surfaces of brick or concrete walls cannot be properly water-proofed, the next best plan is

to put 1-inch furring strips on the wall, then one course of matched lumber, which will form the inside surface of the space to be filled. It will be all the better if the sheathing is covered with damp-proof paper.

Size of ice-chamber.—It is impossible to lay down any general rule for the size of the ice-chambers, as so much depends on what the ice or the refrigerator is used for. In plans 1, 2 and 3, one ton of ice will occupy about 40 cubic feet of space, including covering material. In plans 4 and 5, where no covering material is used, it requires a somewhat less space for a ton of ice, depending on how closely it is packed.

Quantity of ice required for season's supply.—A cubic foot of ice weighs 57½ pounds. One ton of solid ice measures approximately 35 cubic feet. A consumption of 2 cubic feet (115 pounds) per day for four months would amount to nearly seven tons. Allowing for the waste when such a comparatively small body of ice is stored, a building 10 feet square and 10 feet high will afford ample space for that quantity of ice, if it is carefully packed.

Fifty pounds per day for four months would amount to three tons. Allowing for waste, a solid block of ice 6 feet square and 6 feet high should be sufficient if properly stored.

For the purpose of estimating the weight of ice roughly by the number of blocks, the following table will be found convenient:—

12	blocks	18 x 36	inches,	8	inches	thick	=	1 ton.
10	"	18 x 36	"	10	"	"	=	1 ton.
8	"	18 x 36	"	12	"	"	=	1 ton.
7	"	18 x 36	"	14	"	"	=	1 ton.
6	"	18 x 36	"	16	"	"	=	1 ton.
5	"	18 x 36	"	20	"	"	=	1 ton.

Plan for a larger cold storage.—Any person who desires to erect a larger and in some respects a more complete cold storage should apply for a copy of Bulletin No. 36, which gives particulars of a plan designed specially for creamery purposes.

Blue Prints Supplied Free.—**Blue prints on a scale of 1 inch to 2 feet for any of the plans in this Bulletin will be supplied free on application to the Dairy and Cold Storage Commissioner, Ottawa, Ont.**

How to Prepare Whitewash

Slake half a bushel of lime with hot water, stirring continuously, while slaking, strain it and add one peck of salt dissolved in warm water. The proper consistency for whitewash is a thin paste, and water will have to be added to secure this consistency after mixing the dissolved salt with the whitewash.

To each 12-quart pail of whitewash composed as above, add a good sized handful of Portland cement and a teaspoonful of ultra-marine blue. The cement and blue should be added only as the whitewash is being used, and should be thoroughly stirred into the whitewash; otherwise, when applied it will be streaked.

If there are any pipes or other equipment in the rooms to be whitewashed that will rust, do not use salt in the mixture around the piping.

Do not put on too thick a coat—just enough to cover the surface in good shape—then allow from one to three days for drying. If you dry the whitewash out too quickly it will flake or brush off very easily; on the other hand, a very slow drying will allow the water to soak into the wood and may cause unpleasant odours.

Whitewash containing Portland cement must be used without delay.

PUBLICATIONS ON DAIRYING

The following publications of the Department of Agriculture relating to dairying and cold storage are available on application to the Publications Branch, Department of Agriculture, Ottawa:—

BULLETINS

14 The Testing of Milk, Cream, and Dairy By-Products by means of the Babcock Test.
22 The Cooling of Milk for Cheese Making.
25 Coulommier Cheese, Some Notes on its Manufacture.
27 Trial Shipment of Peaches.
36 Cold Storage for Creameries.
41 Cheese Factory and Creamery Plans with Specifications.
44 Cold Storage of Food Products.
50 The Use of Brine Tank Refrigerator Cars for Fruit Shipment.
51 Fruit, The Rate of Pre-Cooling.
52 Methods of Handling Basket Fruit.
53 Butter-making on the Farm.
56 Dominion Educational Butter Scoring Contest, Report on the
58 The Progress of Cow Testing.

PAMPHLETS

2 Simple Methods for the Storage of Ice.
7 Why and How to Use Cheese.
13 Keeping Dairy Herd Records.
Why and How to Use Milk.

CIRCULARS

6 Creamery Cold Storage Bonuses.
10 Cow Testing, Some Notes on
12 Dairy Butter, The Branding of
14 Causes of Variation in the Percentage of Fat in Hand Separator Cream.
15 Cherry pre-Cooling Possibilities.
16 Cow Testing Notes.
20 Cow Testing.
22 Manufacture of Cottage and Buttermilk Cheese.
23 Manufacture of Buttermilk from Skim-milk.
25 Keeping Dairy Herd Records.
26 Care of Cream for Butter-making.
27 Yield and Relative Values of Some Dairy Products.
28 Dairy Industry Act, 1914, with Regulations.
30 Notes on the Cold Storage of Eggs.
31 Cold Storage Temperatures.

CIRCULARS (NEW SERIES)

5 Why and How to Use Skim-milk.
6 Why and How to Use Cream.
7 Why and How to Use Cottage Cheese.
8 Why and How to Use Buttermilk.
9 The Branding or Marking of Cheese and Butter Boxes.

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